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Facultad de Ciencias Económicas y Empresariales

TRABAJO FIN DE GRADO EN DOBLE GRADO INTERNACIONAL EN ADMINISTRACIÓN Y DIRECCIÓN DE EMPRESAS Y EN ECONOMÍA

THE SUSTAINABILITY OF THE SPANISH PUBLIC PENSION SYSTEM: AN ALTERNATIVE REFORM

Pamplona-Iruña 20 de mayo de 2019

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ABSTRACT

In the context of an increasingly aging population, the sustaining of public pension systems becomes more and more challenging. The growing number of pensioners together with the negative consequences of the financial economic crisis of 2008 and thus, the decrease of contributions to the schemes, forced the economies to review their pension systems and carry out reforms that assures their sustainability. This project aims to give a basic knowledge of the situation of the current and future Spanish pension system in comparison with that of one of the countries that has successfully implemented a notional defined contribution model: Sweden. Projections estimated considering different macroeconomic scenarios show the seriousness of the Spanish situation in relation with one of those countries that has opted for this alternative reform and the goodness that moving to another system of comparable characteristics would imply.

KEYWORDS: Pension system, Notional defined contribution system, Actuarial balance
JEL classification: H53, H55, H62

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1. INTRODUCTION

The current debate about the sustainability of public pension systems and the unrest of population who fear that they might not be able to receive a pension in the future, makes this topic a perfect choice for anyone whose aim is to improve the system and search for some solutions to this problem. Even though the pressure exerted by population aging, amplified by the adverse consequences resulting from the financial crisis suffered in 2008, makes public pension systems unsustainable all over the world, the Spanish case is of distinct relevance.

The Spanish long-run demographical tendencies convert the current PAYG pension system in an unsustainable choice according to the forecasts estimated about population growth and life expectancy. It is necessary that the issue is constantly reviewed so more solutions that lead to better systems can be achieved. Thus, the choice of the topic for this project is not merely coincidence but the result of many debates opened about the sustainability of the Spanish pension system and of a personal aim to seek new solutions to a current and constant problem. Our primarily purpose of this project is to study the current Spanish situation, as well as the threats to the sustainability of the system and to search for alternative solutions to this problem.

Sweden is one of the countries with the highest levels of sustainability index according to the Melbourne Mercer Global Pension Index (MMGPI) even though a few decades ago its situation was as problematic as the Spanish one. The application of a notional defined contribution (NDC) system successfully helped to solve the situation and after a transition period of 34 years, the balance in the public social security system has greatly improved. Both the similarities with the current Spanish situation and the outstanding improvement achieved, allow us to consider that a reform of this sort might be appropriate for the Spanish case.

Sweden presents annually since 2001 an actuarial balance that allows an extraordinary level of transparency as well as an annual and fair picture of the public system situation, allowing for the implementation of automatic mechanisms to either improve or at least control the imbalance. A comparison between the Swedish and the Spanish actuarial balance from 2001 to 2006, gives us a first image of how different the situation in both countries is and how Spain could have reacted if it had the Swedish system in place.

Considering this, and conscious about the unsustainability of the current Spanish situation, we have developed some projections of the evolution of the deficit forecasted for the system from now on to 2050. The projections have been made according to three different economic scenarios: an optimistic, a realistic and a pessimistic one; based on different estimations about the main macroeconomic variables chosen for the analysis. Comparing these results with some projections of the Swedish public pension system, we have concluded that the Swedish situation presents much better estimations about the future than the Spanish one, in which the deficit would be at most 3.62 % in the worst scenario by 2050. These results provide evidence enough to confirm the convenience of a notional defined contribution system for our country's pension system.

The remainder of this project proceeds as follows: Section 2 provides us with an overview of the Spanish public pension current situation, including a description of the main threats to its sustainability and the reforms that have been applied. Section 3 proposes a detailed description of an alternative solution to the current problem: the notional defined contribution system. It summarizes the main features of the system and includes a comparison between Sweden and Spain. In section 4 the data used in the empirical analysis is explained and section 5 includes the methodology used. Section 6 presents the results obtained and finally, the conclusions and final remarks are contained in section 7.

2. THE SPANISH PUBLIC PENSION SYSTEM

Nowadays, public pensions constitute one of the most important line items of public spending in most developed countries (de la Fuente, García & Sánchez, 2017). In 2018, public pensions represented in Spain a fourth of the total public spending (García, 2019). Even though an increase in these expenditures will impose a problem to whichever public pension system, it is especially serious for those countries with a pay-as-you-go (PAYG) pension scheme given that the ratio between beneficiaries and contributors is crucial for its financial stability (Ramos, 2014) and thus, the Spanish pension system has been hardly affected.

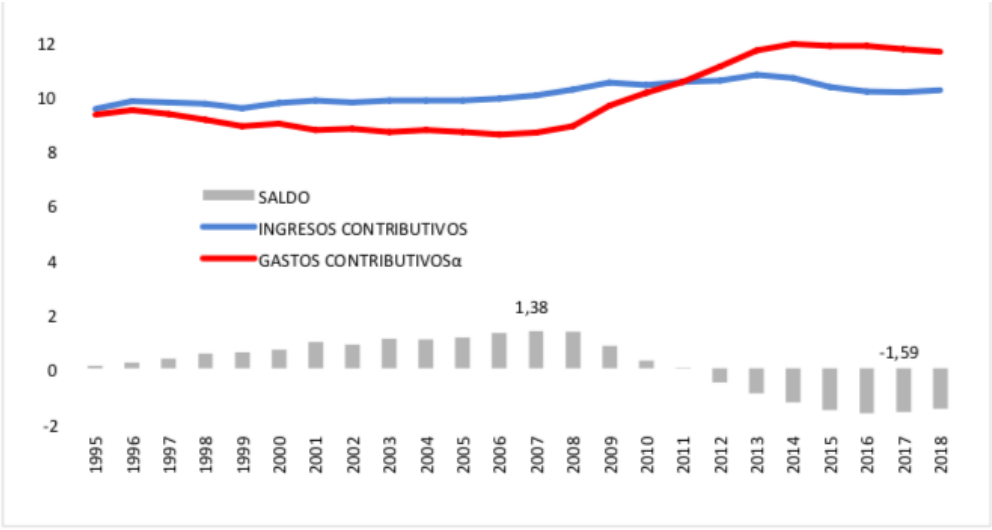
The Melbourne Mercer Global Pension Index (MMGPI) defines the Spanish public pension system as a retirement income system that comprises an earnings-related public pension scheme and a minimum means-tested social assistance benefit. Spain has a mandatory contributory pension system funded with the social security contributions of employers and workers under a pay-as-you-go principle (Hernández de Cos et al., 2017). Nonetheless, with

the last reform it has moved towards a defined contribution model. In the current pension scheme, workers acquire a right to receive a social benefit originated by the contribution done during the worker's active life. The amount of the pension benefits is thereby computed based on individual contribution years and bases although there are some upper and lower limits to the pension amounts that are legally established to assure a progressive redistribution. Besides, the Spanish system has a voluntary contribution that in this case have a very limited scope.

The Spanish pension system is then based on two foundations. The first and most important one is that it is a PAYG system, which implies that current pensions are paid with the contributions or taxes of those working right now and the future pensions will be paid by those working at that moment (García, 2019). We will focus on this contributory part considering the weight it represents over total public spending and the dependency that Spanish population has on it. Nevertheless, it is supported by a capitalization system that can be individually arranged, constituting it the second pillar.

As shown in Figure 1, the financial position of the contributory part of the Spanish system shows a deficit since 2012. The previous period was characterized by a considerably lower expenditure in contributory pensions in terms of percentage of GDP. However, the financial crisis shot it up until this percentage exceeded the 12% of GDP and this gap between income and expenditures is since that moment increasing. Although there has been a slight decrease in the deficit from 2017 to 2018, it seems that the financial imbalance is going to stay in 2019 and onwards, which somehow threatens the sustainability of the Spanish public pension system.

Figure 1: Contributing component of Social Security (% of GDP)



Source: From García Díaz, 2019.

The magnitude of the numbers and the necessity of generating wealth with the contributions of the Spanish population makes it necessary an accurate reform of the pension system that guarantees its sustainability.

2.1. Threats to the sustainability of the Spanish public pension system

International organizations such as the OECD, and prominent researchers (e.g. Vidal-Meliá) have recommended an in-depth modification of the Spanish public pension system. Three issues have been highlighted in most of the studies already performed: the configuration of the pension system, the need of reforms to ensure the financial sustainability of the pension system in the long run and the (un)fairness of the current system. Even though we are going to focus on the second one given that it represents the main problem of the design of the Spanish state pension system, when evaluating potential solutions to this issue, comments on the other two are likely to appear.

Notwithstanding that several are the factors that have interceded in the sustainability of the Spanish public pension system, two have greatly appeared along years in our country and can be considered to be the main cause of the current situation. These include the demographic changes that Spain has suffered, and an economic situation extremely harmed by the financial crisis of 2008. Considering the nature of the pension public system, both factors are of paramount importance for its sustainability.

According to Alonso et al., (2003), the Spanish contributory public system will suffer a hard deficit from 2020 on, to the extent that the aging of the Spanish population accelerates and

the margins of growth in the rate of employment runs out. Similarly, Ahn et al. (2005) affirm that the financial situation of the pension system in Spain will be affected by an adverse future demographic situation.

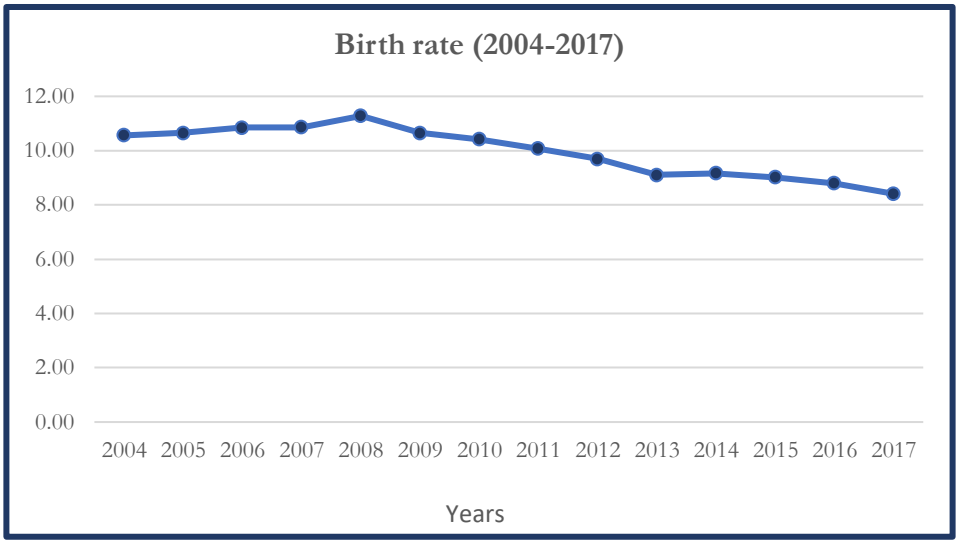
2.1.1. Demographic factors

One of the most common characteristics of developed countries nowadays is the ageing of the population which represents the foremost challenge to pension systems around the world. Last decades Spain has experienced a drastic demographic transformation because of three main factors: rising life expectancy, a pointed decrease in the birth rate and a shift in migration trends which has turned into a negative balance since 2009 (Ramos, 2014). These demographic shifts together with the retirement projections of the so-called "baby-boomers", those born between 1959 and 1977, aggravates the sustainability problems present in the current Spanish public pensions system.

Pension expenditures depends on the number of pensioners and their replacement rate, that is, the amount of the pension benefit regarding their earning during the working life. However, the income to pay for that expenditures depends on the number of workers currently working and their contributions. Considering this equation, it can easily be seen how population ageing represents one of the main concerns for the sustainability of the Spanish public pension system.

According to the data published in the Spanish National Statistics Institute, the number of children born in 2017 has decreased in 4,24% with respect to the previous year. Yet this decreasing trend is not new. Figure 2 shows the evolution of the birth rate every year and it can be easily observed how this diminishing trend comes upon 2008 after reaching its peak and despite its previous increasing trend. Various are the reasons that explain this tendency, including postponement of marriage, an increasing number of women in the labor force, more births outside marriage etc,. However, most of them are related to the end of the economic surplus cycle that the Spanish economy had experienced in previous years.

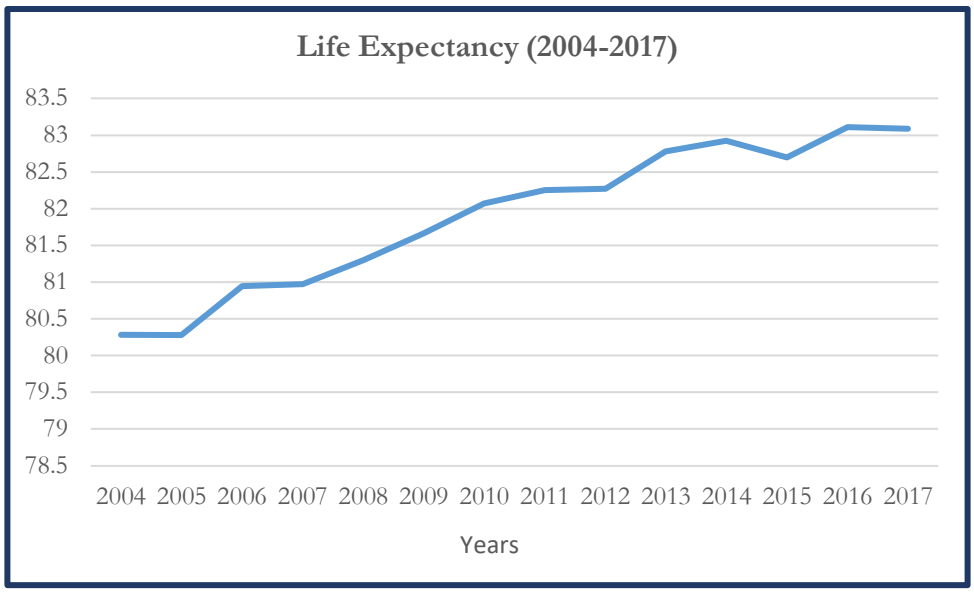
Figure 2: Birth rate evolution in Spain



Source: Own elaboration from The Spanish National Statistics Institute (INE), 2004-2017

Secondly and thanks mostly to health facilities, educational attainment, income and fertility (Mondal & Shitan, 2014), life expectancy has increased greatly, and it is expected to continue to do so in the future given that mortality rates among the elderly continue to decrease. Considering the statistics of the INE, we know that those that are 65 years old nowadays can expect to live three years longer than did those who were that age in 1991. The increase in life expectancy has important implications for individual and aggregate human behavior. It affects fertility behavior, economic growth, human capital investment, intergenerational transfers, and incentives for pension benefit claims (Zhang et al., 2001). Given the interest of our topic, the consequences it has on pension benefits and thus, in the sustainability of the Spanish public pension, are considerably important. A rise in life expectancy originates a more aged Spanish population and therefore, the number of pensioners increases as well, threatening the situation of the current Spanish contributory system.

Figure 3: Life expectancy evolution in Spain



Source: Own elaboration with data from INE, 2004-2017

Lastly, the immigration flows pattern has also suffered changes since 2009, with adverse consequences to our country's public pension sustainability. Despite the fact that Spain experienced a positive migration balance from 2000 to 2009 that led to surpluses in the Social Security system, migration turned negative as the economic crisis unfolded (Ramos, 2014). According to the INE, in 2013 an outflow of more than 250.000 immigrants took place, being most of them working age. As for the immigrants that Spain has, the problem relies on the fact that most of them are concentrated in the range of age from 20 to 40 years. This implies that when they become old, the old-age dependency ratio will increase.

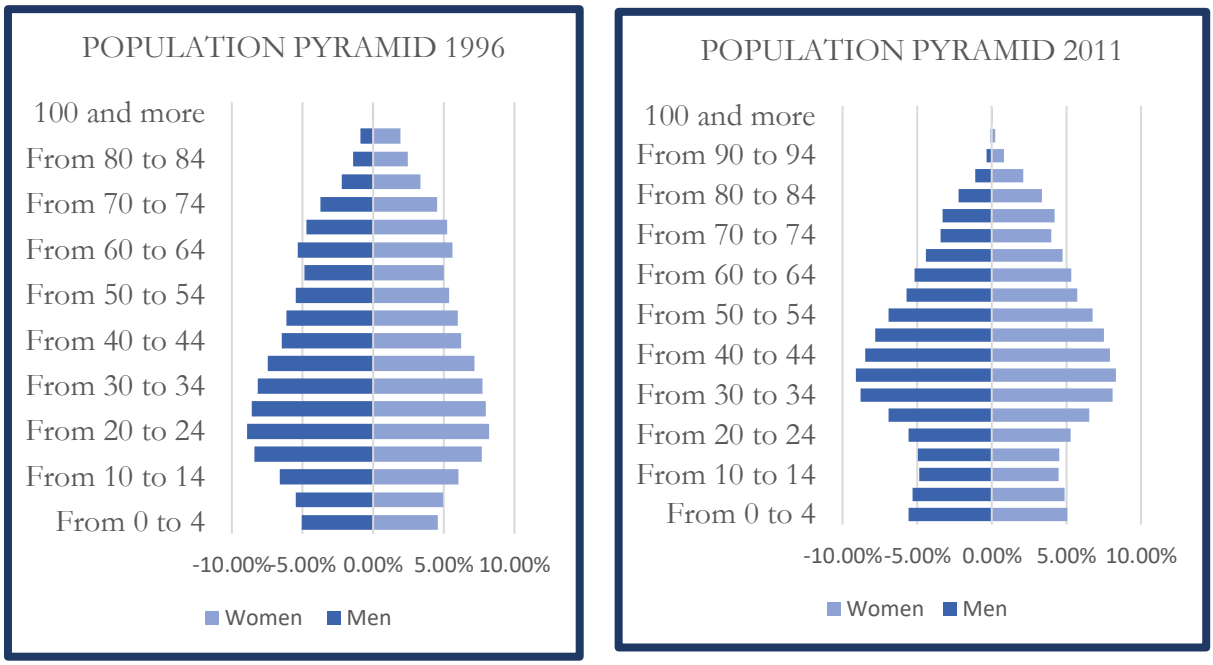
Conde-Ruiz et al. (2008) analyze the effects that immigration has on the sustainability of the PAYG Spanish public pension system. They conclude that the inflow of immigrants in working age moves the financial problem to next generations since they generate rights for receiving future pensions. Additionally, it is predicted that between 2013 and 2022 there will be more emigrants than immigrants, suggesting a decrease in Spanish contributions to the pension system. Overall, neither an increase in migration flow is enough for adding the required resources so as to avoid the financial damage, nor an emigration pattern will benefit the contributory Spanish system.

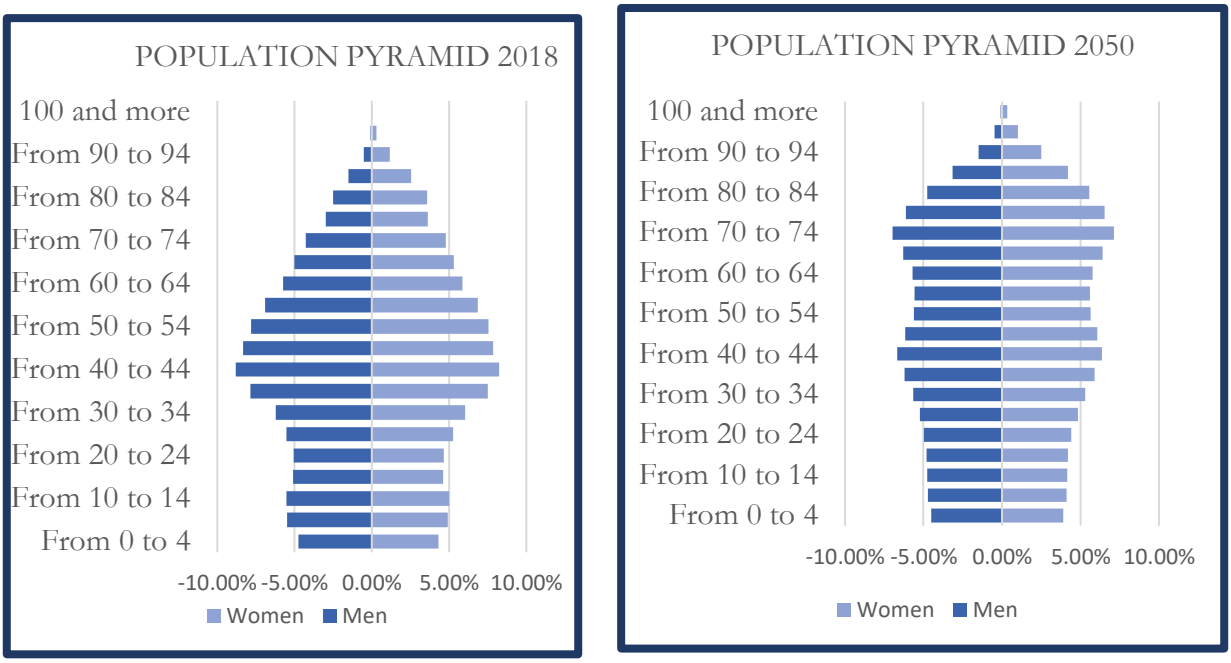
These three factors affect the aging of Spanish population leading to a reduction in the age range between 0 and 49 years that, in fact, constitutes an important part of the population since most of the taxpayers are within it. Furthermore, these demographic changes lead to an increase in the number of pensioners and thereby in pension expenditures with respect

to contributors. The ratio of beneficiaries to contributors will be adversely affected. Hence, this will impact significantly on the balance, sharpening the deficit and hindering the sustainability of the Spanish public pension system.

The commented trend can be verified by looking at the population pyramids in Spain from the years 1996, 2011, 2018 and projections of 2050, in which we can visualize the aforementioned difference. The Spanish population pyramid has suffered a huge change. It has been gradually transformed into a narrower pyramid at the base and wider at the top. The population pyramid of 2050 predicts that with the projections available at the moment, the process is going to be intensified in the following years. In words this implies a large decrease in the number of people below 30 years and an increase in those over 50 years old, meaning that while the number of contributors decrease, the number of beneficiaries increase. The population pyramid of 2050 shows how the largest cohort for both males and females is going to be 70-74 years old, suggestive of the threat that the Spanish demographic structure poses to the sustainability of the system.

Figure 4: Spanish population pyramids: development and projections





Source: The Spanish National Statistics Institute (INE)

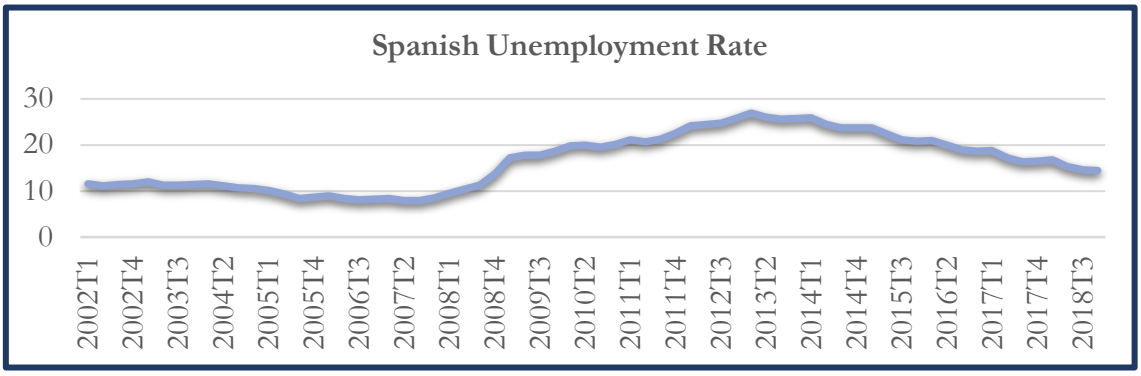
2.1.2. Economic factors

Demography is, however, not the only change to the Spanish public pension system. Spain was hit hard by the international and financial crisis that destroyed the country for many years. The period from 2008 to 2011 was characterized by recession, high unemployment rate and stagnation. The decrease in Spanish labor force together with the associated fall in revenues coming from the Social Security contributions directly affect the stability of the financial situation of the contributory pension system. The deceleration of the increase in the productivity and as a result, of real salaries, represents another important economic factor in the deterioration of the financial situation of the Spanish contributory system (de la Fuente, García & Sánchez, 2017).

As a consequence of the worldwide economic crisis of 2008, Spanish unemployment rate sharpened. As shown in Figure 5, the ratio of unemployed persons by total labor force was stable or even decreasing until 2007. Nonetheless, the Spanish economy suffered during the economic crisis period a destruction of almost 3 million jobs that immediately led to a rapid increase in the unemployment rate. The impending consequence was a decrease in the revenue side of the Social Security contribution system, greatly destabilizing its balance given that not only was expenditure remaining constant, but it was also increasing due to some of the demographic factors already commented. The seriousness of the situation was, however,

weakened thanks to an additional income injection in the form of taxes from the General Administration (García Díaz, 2019).

Figure 5: Spain unemployment rate (2000-2019)



Source: Active population survey, Labor market, the Spanish National Statistics Institute (INE)

Since then, even though an economic recovery has taken place, it has taken years to achieve the levels prior to the economic crisis. The economic recovery initiated in 2014 has not allowed to a reduction in the deficit until 2017 given that the income rate has increased less than pension expenditures (García Díaz, 2019).

2.2. Recent reforms of the Spanish public pension system.

With a view to balancing out the impact of the demographic shifts and the economic climate that the Spanish population has suffered recently, two important pension reforms have taken place in the last decade. The last two Spanish governments have implemented reforms in the public pension system that seek to secure its sustainability trough the introduction of important changes in the contributory pension access, in its computational procedures and in its annual updating rate that is for its first time explicitly linked to a financial health indicator of the system (de la Fuente et al., 2017).

Law 27/2011of 1 August on the update, adjustment and modernization of the Social Security System (in force from 2013), introduced significant changes to retirement eligibility requirements, such as a phased-in increase in the legal retirement age, from 65 to 67; a gradual lengthening of the period considered to calculate the regulatory base of retirement pensions, from 15 to 25 years; and the obligation to provide evidence of having contributed to the system for at least 37 years in order to have access to 100% of the pension (Hernández de Cos et al., 2017).

This law also contemplated the incorporation of a sustainability factor that would align life expectancy to the parameters of the scheme, with the objective of maintaining a proportionality between the social contributions made to the system and the benefits received during the retirement years. This would increase intergenerational equity, as two retirees with the same contribution record but different life expectancies would be entitled to the same pension benefit in actuarial terms. According to this law, this factor would consider the life expectancy at age 67 and in the reviewed year (expecting to reconsider it every 5 years) in relation with the one in 2027.

The estimates available on the impact of the 2011 reform point to a saving of 30%-40% in expected pension expenditure in the long term without these reform measures (Ramos, 2014). However, according to the available demographic projections, these measures will not be enough to ensure the sustainability of the Spanish public pension system. Fairness would be increased although only for contributory pensions, what would generate inefficiency, inequality and inequity for non-contributory pensions.

An article from the Bank of Spain (2017) states that given the deficiencies presented by the reform of 2011, the process was intensified with the enactment of Law 23/2013 that introduces two additional betterments: a new mechanism to calculate the annual revaluation of pensions – the Revaluation Factor (FRA) - (that started in 2014) and the sustainability factor into the pension system (starting in 2019) with the name of Intergenerational Equity Factor (FEI in Spanish). The former was aimed to set the annual pensions increase using a formula based on the system's budget constraint, whereas the latter constituted an automatic mechanism that links the initial amount of retirement pensions to life expectancy.

The sustainability factor was planned to be introduced in 2019, consisting on an extra factor in the benefits formula of the initial pension that would reduce the future benefits when the life expectancy of population aged 67 increased, making the system more like a notional defined-contribution one. However, the difference lies on considering the projected life expectancy of the age when the individual is retiring (as in a notional definite contribution system) and the life expectancy for 67 years-old population at that time regardless the age of the individual that is retiring, as both ages do not necessarily coincide (Banco de España, 2009).

Before the law of 2013, the growth of the benefits every year was in harmony with the Consumer Price Index. Since then, the indexation would also consider budgetary and

economic conditions of the system, reinforcing a balance system and equilibrating the system in the long-run. Nonetheless, this instrument is limited by the maximum and minimum rates that can be applied: pensions will not be increased by more than the Consumer Index Price plus 0.5% and not less than 0.25% if the expenditure is greater than the revenues from social contributions.

The introduction of these elements placed Spain among the group of EU countries that have automatic adjustment mechanisms or sustainability factors for the public pension system (Hernández de Cos et al., 2017). Although the European Comission (2015) states that both reforms are expected to decrease the pension benefits 7% and 24% in 10 and 20 years, they are not enough for avoiding falling into a structural deficit and they do not solve the problems that the Spanish public pension system currently presents. Hence, alternative solutions might be required.

3. AN ALTERNATIVE REFORM: NOTIONAL DEFINED CONTRIBUTION SYSTEM

3.1. Notional defined contribution system.

Considering that Spain is trying to improve the sustainability of its public pension system through measures already adopted in other European countries, the implementation of a PAYG system based on notional accounts could be of distinct relevance. The cases of countries such as Italy, Norway, Poland, Latvia and Sweden are particularly interesting because they have notional defined-contribution account systems that operate on an actuarial basis. That is, worker's contributions throughout their working life are accumulated in a fictitious (notional) account to which a rate of return is applied according to demographic and/or economic variables and is this which determines the value of their pension when they retire (Ramos, 2014).

As the World Bank (2010) states, notional accounts are designed to mimic a defined contribution plan, where the pension depends on contributions and investments returns. Pension contributions are tracked in accounts which earn a rate of return. However, in notional accounts, the return that contributions earn is a notional one, set by the government, not the product of investment returns in the markets. Pension systems use individual registers where contributions are noted down for each contributor and all of them apply formulas to transform those registered figures into social security benefits. A notional account makes use of the information included in such registers in a different manner than

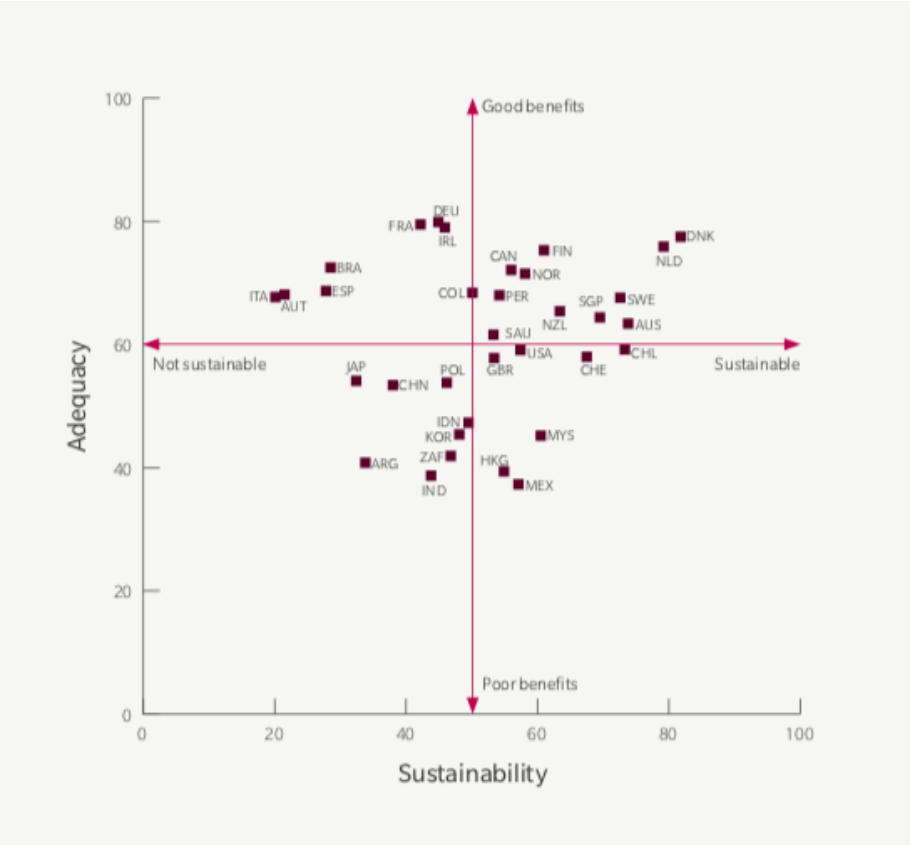
the traditional contributory system does. An individual virtual account is created where contributions are deposited, and some fictitious returns are added once a year to hand in, at retirement age, the fictitious amount accumulated throughout the individual working life.

The introduction of what are known as notional (or non-financial) defined contribution pension accounts (NDCs), as a component of modern multi-pillar pension systems in some countries, have been one of the main innovations of the las two decades as regards pension reform (Vidal-Meliá et al., 2015). Sweden is one of the few countries in Europe to have implemented this reform and it is particularly interesting given the context and conditions in which it was developed and its favorable evolution for the sustainability of its public pension system.

Representatives of the European Commission have described the Swedish model as the only really sustainable approach to pension reform (Scherman, 2003). It represents a clear example of how some changes motivated mainly by the aging of the population led to a system that has improved the financial stability of the country's public system. The Swedish reform needs were similar to those predominating in most developed countries and thus, in Spain: a normal pension age that had been unchanged for decades instead of an increasing life expectancy; a "baby boom" generation approaching retirement; and an overgenerous benefit system.

Furthermore, Sweden is according to the MMGPI one of the countries with a system that has a sound structure with many good features. Figure 6 shows that Sweden is in the top right quadrant of the map, suggesting that its public pension system balance the dual goal of delivering financial security for its retirees adequate for the individual and sustainable for the economy in general. On the contrary, although the public pension of Spain is adequate for the individual, it is far from sustainable for the economy according to the index. All this makes it intriguing to study how a reform similar to the one applied in the Sweden case could improve the current situation of the Spanish public pension system in terms mainly of sustainability.

Figure 6: Sustainability Vs. Adequacy of pension systems' map.



Source: Taken from MMGPI, 2018.

3.2. The Sweden case.

The most important change in the old-age Swedish pension system between 1980 and 2015 was the major pension reform decided in the Swedish parliament in 1998 (Palme et al., 2018). Motivated by the aging of the population, in 1998 Sweden passed legislation that transformed Sweden's public pension system to a notional defined-contribution (NDC) plan (Sunden, 2006). An important objective behind this reform was to design a system that was both financially and politically sustainable in the long run.

In the mid-1980s, actuarial projections began to show that the Swedish pension system would face considerable financial shortfalls in the future (Sunden, 2006). The main factors contributing to this trouble were a system susceptible to economic development, moderate productivity as well as an aging population, similar to other industrialized countries. Taking the aforementioned problems into consideration, and without much agreement at the beginning, the result was an earnings-related system with notional accounts that was combined with a funded individual account component. There was, however, a gradual

transition into the new system. Persons born in 1934 received a 20 percent of their benefit from the new system and 80 percent from the old system (Palmer, 2000).

The Swedish pension system, which has a total contribution rate of 18.5 percent, has two components. The first, and major, component is a PAYG notional defined contribution plan, which receives 16 percentage points of contributions. The second component is an individual account, the Premium Pension, which receives the remaining 2.5 percentage points (Sunden, 2006).

Contributions are recorded in workers' individual accounts and the account values there represent individual's claims on future pension benefits. They are split equally between employees and employers; employee contributions are limited by a ceiling, while the employer's share is levied on all earnings (Sunden, 2006). The account value at the close of any year consists of contributions during the year plus the account value from the previous year, indexed to the rate of growth of covered earnings (Palmer, 2000). At retirement date annual benefits are computed by dividing the balance in the notional account by an annuity divisor that is usually fixed by law, and several options exist.

In Sweden, this divisor is determined by average life expectancy at retirement for a given cohort at age 65, and an imputed real rate of return of 1.6 per cent that is the expected long-term real growth rate of the economy assumed by the reformers (Sunden, 2006). This was done with the purpose of providing a relatively high initial benefit instead of increasing it after retirement. Yet the amount of the annuity is not fixed, since benefits will be adjusted annually for inflation. Besides, the divisor is the same for both genders, so an average unisex life expectancy is used. A summary of the main characteristics of the notional defined contribution Swedish system can be found in Table 1.

Table 1: Principal characteristic of the Swedish NDC pension system.

Pension system configuration	3 pillar-based system: 1. PAYG financed by notional accounts of definite contribution (16.5% contribution) 2. Premium mandatory plan of individual capitalization accounts (2.5%) 3. Complementary based on Collective Plans
Divisor	Per capita real wage growth rate
	Standard formula with unisex mortality tables, minimum guaranteed pension at 61 and

Basic characteristics of the pension retirement formula	certification of unemployment, sickness and temporary disability periods. Real interest rate of 1.6%
Revaluation causal pensions	CPI ± differential that retains the discrepancy between the real and expected wage growth.
Transitory measures	Yes. The new formula is only applied for those born as of 1954. The total implementation is expected to be before 2020.

Source: Own elaboration from Devesa-Carpio et al., (2004)

3.3. Convenience to the Spanish contributory public pension system

In an NDC system, the annual contributions are used mainly to pay the social compensations in force. As the contributions that are collected every year are also spent, the individual accounts do not consist of real money nor financial assets pledged by property rights, nor capitalization. That is why they have been classified as fictitious accounts. Nonetheless, the computation of the notional account is real in the sense that it determines the pension that is being paid to contributors when they retire. If the annuity divisor is judiciously chosen, a bound between the contribution quantity and the accumulated notional fund is created which increases the financial sustainability of the system in the long-run (Vidal-Meliá et al., 2007). This is an advantage exclusive of notional defined contribution systems that is not shared at all by all PAYG systems.

One of the main virtues of a system based in notional accounts is that it facilitates the construction of the system's actuarial balance. Contradicting with the practices followed by these systems, traditional contributory pension systems neither prepare nor publish actuarial balances for their members and the public opinion in general; not even for the public authorities that are the ones that guarantee them. This is not a consequence of the PAYG system given that there exist countries that fund their public pensions with this sort of system and publish actuarial balances.

The notional defined contribution system is a tool that tends to neutralize, eradicate, cancel and minimize what has been called as "populism". According to Valdés-Prieto (2006), populism can be defined as the competition face by politicians that consist of offering subsidies or grants without noticing that they are the ones that will pay them later in the form of higher taxes, higher contributions, higher inflation or lower growth. This is a problem that could be lighten if accountancy is realized according to an accrual base, informing in the

actuarial balance about the increase in the passive side that certain measures imply. This system serves to depoliticize the design changes and minimize the electoral use of the PAY system, adopting measures with a long-term planning horizon to bring about greater intergenerational equity. Contrary to traditional PAYG systems, NDCs introduce periodic automatic adjustments without the necessity that they be approved by politicians.

The Sweden notional defined contribution system computes and publishes annually its actuarial balance since 2001 and it constitutes a role model as it has introduced really desired elements from the perspective of a rational management of pension systems: an extraordinary level of transparency, the almost immunization of politic risk and an automatic mechanism that corrects financial disequilibrium and increases the trust of the system contributors (Vidal-Meliá et al., 2007). Furthermore, the Sweden actuarial balance follows the traditional structure of the accounting balance sheet consisting of double-entry transactions. Not only the Sweden double entry method provides information about the financial position changes in the system during that year, but it also quantifies the causes of those changes. Nevertheless, any event that takes place after the balance sheet date are not quantified.

Another advantage of an NDC system is that it mitigates the disincentive effect towards working that individuals might present given that the retirement benefits depend on the contributions made during their working life and therefore, individuals see contributions as differed wages rather than as taxes. The application of an actuarial balance makes it easier for individuals to understand the accumulation of funds and therefore, the transition to a capitalization system will be considerably easier by simply converting the notional account into a real account.

Hence, the advantages that this system provides are that it encourages labor supply by linking benefits to lifetime contributions, it is sensible to demographic change, it is fair since earnings are linked to earnings' history and the ease in flexible retirement. There are however some political challenges. Confidence in the PAYG pension system is steadily declining during the past two decades (Börsch-Supan, 2006). Every reform needs then to prove that things will eventually get better than without them.

Overall, and taking into consideration that it is not a perfect system, we find it to be a potential solution to the Spanish public pension system difficulties. It is clear that the current system presents problems that were it not solved, would jeopardize its sustainability in the

very near future. The objective of the Swedish reform was to design a fiscally sustainable system tied to economic growth with a clear link between contributions and benefits (Sunden, 2006) and thus, this is consistent both with the aims currently pursued by the Spanish authorities and with our, as we look for alternatives that could improve the current public pension system Spanish situation.

Nothing prevents that the actuarial balance can be applied in a defined contribution PAYG such as the Spanish one, mainly if there is a clear distinction between the contingencies of retirement and other contingencies. In sum, the actuarial balance applied in the Sweden pension system is convenient to the Spanish one in order to improve its transparency, solvency and to facilitate the elaboration of reforms to be introduced in the system (Boado-Penas et al., 2011).

3.4. Transition to a notional defined contribution system.

If an NDC system were to be applied in our country, a potential path of transition between both systems should be outlined over which the current traditional system would be replace by a two-pillar based system: a notional system complemented by an explicit subsidies' system for those that have had low income throughout their entire life. This proposal follows the one done in the Sweden case and the one carried out by Vidal-Meliá et al., (2007).

Table 2 presents the transition for Spain, where both systems, the current one and the two-pillar NDC system coexist for 34 years. The participation of the new system will growth gradually in time and by 2052 the Spanish public pension system will have been completely transformed.

Table 2: Spanish transition calendar

Retirement year	New system proportion (%)	Current system proportion (%)
2019	0	100
2020	3	97
2021	6	94
…	…	…
2027	24	76
…	…	…
2049	93	7
2050	96	4
2051	99	1
2052	100	0

Source: own elaboration based on the information from Boado- Penas et al., 2007

Of course, this proposal can be varied. The main virtue of the offer is that it allows that those working now, begin their notional individual account with a null fund given that the pension is computed applying both systems. On the other hand. the main drawback is that the weaknesses of the current system are extended in time.

3.5. Actuarial balance

Already mentioned are the virtues that computing and publishing annually an actuarial balance implies for the pension system. The actuarial balance sheet of a PAYG system is the financial statement showing the present discounted value of the pension system's benefit promises to contributors and pensioners at a particular date (liabilities), together with the amounts of the various assets (financial, real and contribution-based) that back up those promises (Boado-Penas et al., 2008). According to Valdés-Prieto (2002) the actuarial balance contains a projection of the future at present value. This property allows to register the behavior of the different cash flow records.

The main entries that are integrated in the actuarial balance are the ones shown in Table 3. Generally speaking, it can be stated that a PAYG pension system is reasonably solvent, and that therefore at the date of the balance sheet the participants should have a realistic expectation of receiving the benefits that have been promised, without the sponsor of the system (the State) having to make non-statutory contributions (Boado-Penas et al., 2008), as long as:

$$\textit{Financial and Real Assets} + \textit{Contribution Asset or Hiden Asset} \geq \textit{Liability to Pensioners} + \textit{Liability to Contributors}$$

This implies that the accumulated deficit must be nil or negative. If positive, the pension system is insolvent and therefore, at some point in the future the sponsor will be forced to allocate extraordinary funds to cover the deficit, or that the promises made to some of the participants will be at least partially broken.

Table 3: Main entries of the balance sheet of a PAYG system

ASSETS	LIABILITIES
Financial and Real Assets	Liability to Pensioners
Contribution Assets	Liability to Contributors
Accumulated Deficit	Accumulated Surplus

Total Assets	Total Liabilities

Source: Own elaboration from the information at Boado-Penas et al., 2008

According to Boado-Penas (2009), currently and not only in Spain, politicians and the public opinion in general take as their point of reference of the solvency indicator the annual cash deficit or superavit; that is, they confuse a solvency indicator with a liquidity indicator. Therefore, to evaluate the solvency of a system, it is necessary to elaborate an actuarial balance.

3.5.1. Entries of the actuarial balance

Previous literature has named differently the most important entry that this balance sheet possesses: Contribution Asset, that is sometimes named "Hidden Asset". Although some discrepancies in naming exist because theoretically both names are referring to two different things, for the purpose of this project it is enough to identify them as Contribution Assets given that it is how it has been applied to compile the balance sheet for social security in Sweden. Contribution Assets can be interpreted as the maximum level of obligations that can be back up in the long-run for a specific contribution rate without requiring extraordinary funds to cover the deficit, if the conditions of the balance at that specific date remained unchanged.

The *Contribution Asset* is a concept that stems from connecting the actives and liabilities of the pension system. It is computed under the hypothesis of a "golden rule" steady-state scenario, that is defined by the property of having a real interest rate equal to contributions real growth rate, pension liabilities and the whole economy in general. That is why the interest rate used to compute the Contribution Assets is directly obtained from the real growth rate of the economy and it is not necessary then to do research on the financial market so as to identify the applicable interest rate (Vidal-Melía et al, 2007).

Contribution Asset is the outcome of a formula that points out the magnitude of both the actives and liabilities of the actuarial balance when the pension system is in actuarial equilibrium and it is the case of a pure PAYG, under a simplified scenario. That is, the formula presupposes that the ratio actives to passives is one, and that the degree of capitalization is zero. This method identifies the size of the asset without delving into the origin or economic meaning of the cash flows that support it (Boado-Penas et al., 2008).

Contribution Assets are computed as the product of annual contributions by the *turnover duration* (TD). The turnover duration also known as the maturing period of the system is the time expected to go by since the moment that a monetary unit enters the system in the form of a contribution until it exits it in the form of pension benefit (Boado-Penas et al., 2011). In other words, it is the difference between the weighted average age of pensioners and the weighted average age of contributors; that is, the average years that a monetary unit is in the system before ii exits it in the form of a pension disbursement.

In Sweden, with the purpose of softening the variation of the annual results, both annual contributions and the turnover duration are not strictly those of the current year, but they are averaged with those of the two former years (Boado-Penas et al., 2011). When population is decreasing (increasing) the turnover duration would be slightly overestimated (underestimated) and consequently the Contribution Assets in comparison with the liabilities. As every year the balance is computed under real data, the balance tends to provide a fair image of the reality. The demographic and economic steady-state scenario is not real, but due to the slowness in the changes that are gradually gathered in the successive actuarial balances, the solvency ratio remains fully valid.

The computation of the *liabilities* contained in the balance sheet takes into account real details of the benefit formula and current demographic and economic circumstances, which makes this calculation more difficult than steady state assumptions. On the one hand, the liabilities to contributors are the notional capital accumulated in contributors' accounts and the one derived from the commitments with contributors as a result of the old system. On the other hand, the liabilities to pensioners are the discounted value of the pensions that have to be paid to the current pensioners, taking into account the current life expectancy and the technical interest rate to be applied (Boado-Penas et al., 2011).

The *accumulated superavit* is the accumulated profit or equity of the pension system, that is property of the sponsor of the system, the State in this case. The actuarial gain or loss from the system in one period is the difference between the increase in the actives and the increase in the liabilities during that period.

3.5.2. The Swedish experience with the actuarial balance sheet

Sweden annually publishes its actuarial balance sheet since 2001 and Table 4 shows the Swedish actuarial balance sheet evolution as % of GDP since then to 2006. One of the main characteristics of the actuarial balance sheet is that both the assets and liabilities are valued

on the basis of verifiable cross-section factors, that is, no projections are made. Therefore, current information is used even tough expectations take place about some demographic factors. Long term projections for the system's future evolution are actually included in the annual report published of the Swedish pension system, including three different scenarios. Nevertheless, this information is not used in the preparation of the statements and it is not used to make annual decisions or adjustments that may affect contributors and pensioners (Boado-Penas et al., 2008).

Table 4: Balance sheet of the Swedish pension system at Dec.31 of each year as % of GDP

Year	2006	2005	2004	2003	2002	2001
ASSETS						
Financial Asset	30.3	28.8	25.2	23.5	20.6	24.7
Contribution Asset	209.9	214.2	218.6	222.2	223.2	222.2
Total Assets	240.2	243.0	243.8	245.7	243.7	246.9
LIABILITIES						
Liability to Contributors	167.8	172.7	174.9	175.4	175.3	172.3
Liability to Pensioners	68.9	69.2	68.5	67.9	66.3	65.1
Accumulated Surplus	1.0	0.3	2.3	2.1	9.2	9.5
Change in Net Worth	2.5	0.7	-1.9	0.3	-7.0	
Total Liabilities	240.2	243.0	243.8	245.7	243.7	246.9
FUNDING AND SOLVENCY INDICATORS						
Solvency ratio	**1,0149**	**1,0044**	**1,0014**	**1,0097**	**1,009**	**1,0402**
Degree of funding %	**12.80**	**11.90**	**10.35**	**9.64**	**8.51**	**10.40**
(Liabilities to Contributors/Liabilities) %	**70.9**	**71.4**	**71.8**	**72.1**	**72.6**	**72.6**

Source: own elaboration from the information at Boado-Penas et al., 2008.

Considering the information provided in Table 3, the degree of funding of the system is clearly positive which allows possible shortfalls in the system's income too as compared to expenditure to be dealt with by selling financial assets (Boado-Penas et al., 2008). In fact, it reaches it maximum the last year studied which might imply a positive perspective for the evolution of the system. Besides, given that the solvency ratio for all the years being studied is higher than 1, the Swedish pension system presents a high degree of solvency. It is not probable then that support from the State will be sought, which is indicative of a sustainable situation at least during the years studied.

3.5.3. Spanish actuarial balance sheet

Our first aim was to replicate the Sweden actuarial balance for Spain until year 2018 so as to understand how it would be the current situation if Spain had a notional defined contribution

system and therefore assess the appropriateness of this system to the Spanish case given that compiling a balance sheet of this sort is essential. We also wanted to do some projections from this data to see the evolution and future sustainability of the system, but the available data is not enough for computing it and as already mentioned, the actuarial balance do not use projections but just current available data.

Nonetheless, Vidal-Meliá et al., (2007) have computed some estimates of the actuarial balance sheet for the Spanish contributory retirement pension system for the period from 2001 to 2006 following as far as possible the philosophy used to gather the Sweden balance sheet, that offer a first image of the Spanish situation measured in actuarial terms. Given that there are differences in the design of the system (defined-benefit versus notional defined-contribution), this data does not provide evidence on how an NDC would change the Spanish situation. However, it gives interesting information to contrast both systems and look for possible advantages of applying the Sweden model. The evolution of the balance sheet for the Spanish public pension system for the period 2001 to 2006 is shown in Table 5.

Table 5: Balance sheet for the Spanish pension system at 31 December each year (% of GDP)

Year	2006	2005	2004	2003	2002	2001
ASSETS						
Financial Asset	3.68	3.00	2.3	1.54	0.85	0.36
Contribution Asset	192.21	189.18	189.25	194.73	196.85	204.49
Accumulated Deficit	85.46	88.72	79.30	76.58	67.17	71.96
Losses for the period	4.12	3.42	16.32	8.55	15.01	0.00
Total Assets	285.47	284.32	287.17	281.40	279.88	276.81
LIABILITIES						
Liability to Contributors	225.45	223.49	226.41	219.77	216.56	214.70
Liability to Pensioners	60.01	60.82	60.76	61.63	63.31	62.11
Total Liabilities	285.47	284.32	287.17	281.40	279.88	276.81
FUNDING AND SOLVENCY INDICATORS						
Solvency ratio	**0.686**	**0.676**	**0.667**	**0.697**	**0.706**	**0.740**
Defree of funding %	**1.29**	**1.06**	**0.80**	**0.55**	**0.30**	**0.13**
(Liabilities to Contributors/Liabilities) %	**79.0**	**78.6**	**78.8**	**78.1**	**77.4**	**77.6**

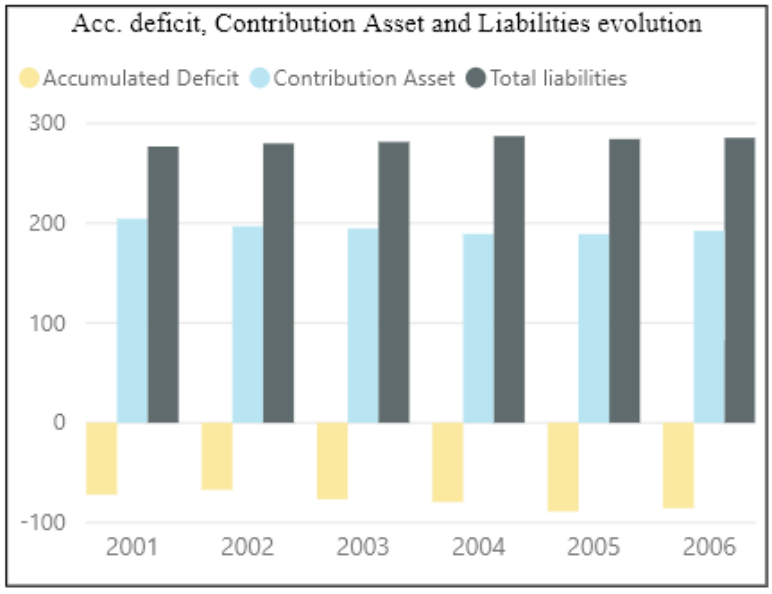
Source: own elaboration from Vidal-Meliá et al., 2007.

The results allow for an interesting interpretation of the Spanish situation during those years that allows for overviewing the imbalance of the system in relation with that of Sweden. The

value of the financial asset shows an increasing tendency, rising from 0.4 percent to 3.7 percent of GDP due to the cash-flow surplus that the contributory system suffered those years. The degree of funding remains low, hardly reaching 1.3 per cent of liabilities in 2006 whereas in Sweden it was 12.8 percent that year. This is the result of the increasing tendency followed by the liability side and the decreasing pattern of the contribution assets. Not only the value of the contribution asset is smaller than in Sweden, but it also has fallen by 12 percentage points of GDP in 5 years.

Figure 7 shows the evolution of the assets, liabilities and accumulated deficit (as % of GDP) of the Spanish pension system considering the data contained in Table 5 for the period studied. The graph corroborates that contribution assets follow a decreasing tendency whereas liabilities are augmenting. Consequently, the accumulated deficit is also increasing. Given that this data is for the period before the Spanish economic crisis and considering the current Spanish situation, if a Spanish actuarial balance sheet were to be updated, we would expect this deficit to be higher as well.

Figure 7: Evolution of the Spanish accumulated deficit, contribution asset and liabilities.

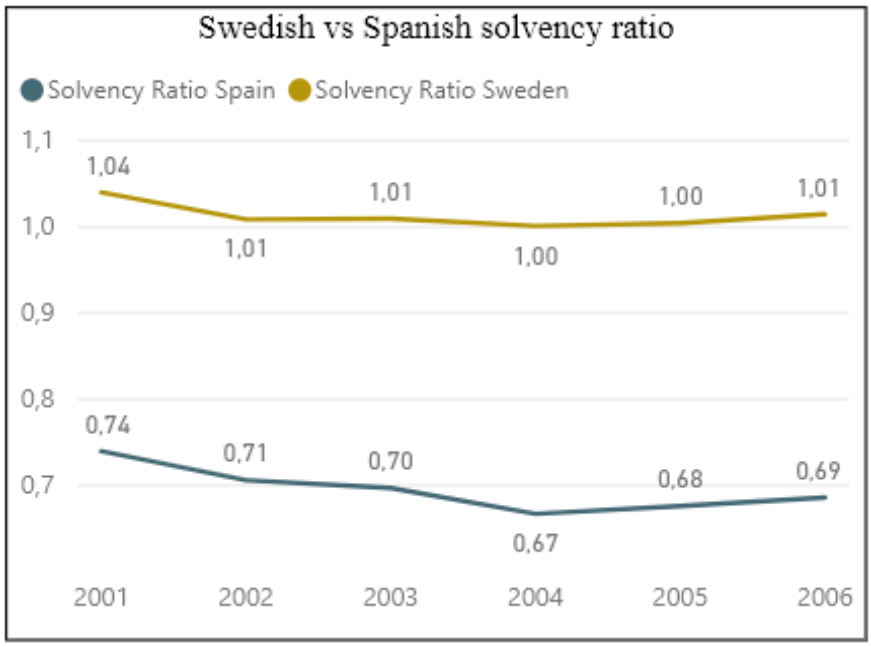


Source: Own elaboration

By comparing Tables 4 (Sweden) and 5 (Spain) we can see the difference between the solvency of the Swedish system, that can back up all its liabilities, and the insolvency of the Spanish one, that can back up just 68.6% of its liabilities. This information is summarized in Figure 8 that shows graphically the evolution of the solvency ratio for both countries. Even

though the pattern followed by the solvency ratio of both countries is comparable, throughout all the period studied the Swedish solvency ratio is 0.3 higher than in Spain. In the Swedish system, new participants do not bring any additional deficit. However, in the Spanish one the new participants increase the pension system's deficit and therefore, the level of insolvency in Spain increases as the number of contributors increases.

Figure 8: Swedish vs. Spanish solvency ratio evolution



Source: Own elaboration

One of the main differences between both systems is the automatic balance mechanism. In the Spanish defined-benefit design, the current evolution continues until new legislation is adopted. By contrast, if the Swedish system had a balance sheet like the Spanish one, the automatic balance mechanism would be activated immediately. This would reduce the notional interest rate, cutting liabilities to contributors, and would also reduce the rate of indexation of pensions, reducing liabilities to pensioners. This harsh adjustment would be maintained automatically until the balance sheet reached solvency (Boado-Penas et al, 2008).

These results ratify the assumptions made about the deficiencies that the Spanish public pension system presents as well as the benefits that introducing a system of these characteristics in our country will imply. Nevertheless, this information is not yet updated. Given that the available information is not enough for updating the actuarial balance sheets, some projections are done in Section 6 with the available information and differentiating various macroeconomic scenarios with the aim to provide evidence on the problems of the

system if adequate reforms are not taken. These results are then compared to those for Sweden so as to see the differences in the sustainability of both systems, which are suggestive of the advantages and drawbacks that the different systems provide.

4. DATA

To analyze the future situation of the Spanish public pension system considering the economic and demographic available information and, thus, to verify whether alternative reforms such as the implementation of an NDC system would be needed; the PENSREF: Pension Reform Database and the Spanish Social Security Institute (INSSS in Spanish) have been primarily used to gather the required data and to elaborate different scenarios for assessing its future sustainability.

The memories published by the Spanish Social Security Institute (INSS) contain information about the main variables needed to understand the situation of the Spanish pensions. They provide data about the Spanish Social Security and are classified according to the difference Spanish autonomies, by gender and by the different types of pensions. The most recent memory published is that of 2017 and so, the one that contains the most appropriate information for this analysis. 2017 will be therefore the base year from which projections will be made.

Simultaneously, the PENSREF database provides long-term projections of some of the most relevant variables influencing pension evolution for all the European Member States based on population projections from the Eurostat. To do forecasts about the Spanish pensions situation it is necessary to stablish different macroeconomic scenarios (e.g. PIB, employment rate, TFP…). Estimations about this macroeconomic information, together with data about projections of some of the most important demographic data as well as other relevant variables for our analysis, can be found in Appendix I and are the ones that are going to be employed in the following analysis.

Finally, and considering the proposals made about increasing the pension spending according to the CPI index, the pension revalorization of 1.8% used by the AIReF in its projections has been also used in our analysis. Assuming a maximum increase in the Social Security income of this percentage, we would be gradually adjusting the system spending with the income.

5. METHODOLY

In this section we present the initial scenario to test the evolution of public pension spending as well as the methodology used for the projections made. To provide evidence regarding the seriousness of the situation that the Spanish public pension system is facing and will face if appropriate reforms are not taken, and thus, the need to act immediately, an analysis based on projections until year 2050 have been performed. The analysis has been subdivided into three different scenarios: a pessimistic, a realistic and an optimistic one. For the realistic one, we have considered estimations about some macroeconomic variables from the PENSREF database; for the pessimistic one, we have computed a 1% less change in the rate provided by this realistic data; and for the optimistic one, we have added up a 1% to the base data. A summary of the assumptions made in each scenario is shown in Table 6.

Table 6: Macroeconomic data used in the different scenarios.

	2020	2030	2040	2050
GDP				
Optimistic	9%	14%	11%	19%
Realistic	8%	13%	10%	18%
Pesimistic	7%	12%	9%	17%
Employment Rate				
Optimistic	-2%	3%	-3%	3%
Realistic	-3%	2%	-4%	2%
Pesimistic	-4%	1%	-5%	1%
TFP				
Optimistic	6%	8%	10%	12%
Realistic	5%	7%	9%	11%
Pesimistic	4%	6%	8%	10%

Source: Own elaboration.

The three macroeconomic variables chosen for developing the projections are the gross domestic product (GDP), the employment rate and the total factor productivity (TFP). We have made estimations of both pension spending and contribution income as proportions of total GDP and therefore, we consider it to be an important variable for our results. Additionally, both the employment rate and the total factor productivity are relevant for wages, for tax collection and ultimately for the income of public pension systems. We have used these two variables to forecast the evolution that the Spanish contribution income might follow and thus, estimate a representative deficit or superavit of the system.

Simultaneously, some assumptions shared by the three different scenarios have been made to compute the growth in the number of pensioners, in the average pension and in the contribution income. Notwithstanding that several are the demographic factors affecting the pattern followed by the number of pensioners and following the reasonings of other studies, we have considered life expectancy as a representative variable from which infer the evolution in the number of pensioners. Thus, the evolution of this variable has been computed by a rule of three considering the life expectancy estimations: the higher the life expectancy, the more pensioners would be. Similarly, and consistent with the proposals claiming pension revalorizations dependent upon the CPI, we have estimated that the average pension would increase according to the 1,8% per year estimated by the AIReF. We estimate the following equation:

$$\text{Average pension}_t = \text{Average pension}_{t-1} * (1+1.8\%)^{(t-(t-1))}$$

Total pension spending is then computed as the product of the number of pensioners and the annual average pension and its evolution will depend both on the foreseen life expectancy and the pension revalorization being used.

Contribution income has been computed following the same rational but considering more variables: unemployment rate, inflation and total factor productivity. We have assumed that the inflation rate remains equal for the different ranges of time and that is equal to the maximum CPI of 1.8% presented by the AIReF. The equation estimated is the following:

$$\text{Cont.Income}_t = \text{Cont.Income}_{t-1}*(1+ e_r)*(1+ TFP_t)*(1+1.8\%)$$

where e_r is the employment rate for the period and TFP_t the TPF growth rate for the period and that will vary both depending on the period of time and on the scenario.

6. RESULTS

In this section we turn to examine the results obtained from the analysis. Table 7 summarizes them distinguishing the three scenarios used: optimistic, realistic and pessimistic. The results show that all of them share an increasing tendency in the deficit exhibited by the Spanish pension system. In the worst case, this deficit could sum up 3.61% at most. This deficit is explained by the opposite directions that pension spending and contribution income follow, that imply an enlargement of the gap between them and thus, a deterioration of the pension-income imbalance. These results are consistent with the pyramid of population of 2050, in

which we have seen how the hard change in the structure of the population might threaten the sustainability of the system.

Table 7: Deficit evolution in the three different scenarios (% of GDP).

Optimistic	2017	2020	2030	2040	2050
Pension Spending	9,14%	8,88%	9,48%	10,31%	10,47%
Contribution Income	8,85%	8,61%	8,60%	8,40%	8,29%
Deficit	**-0,28%**	**-0,27%**	**-0,88%**	**-1,92%**	**-2,18%**

Realistic	2017	2020	2030	2040	2050
Pension Spending	9,14%	8,96%	9,65%	10,60%	10,85%
Contribution Income	8,85%	8,52%	8,42%	8,14%	7,96%
Deficit	**-0,28%**	**-0,44%**	**-1,23%**	**-2,46%**	**-2,89%**

Pesimistic	2017	2020	2030	2040	2050
Pension Spending	9,14%	9,04%	9,83%	10,89%	11,24%
Contribution Income)	8,85%	8,43%	8,25%	7,89%	7,63%
Deficit	**-0,28%**	**-0,62%**	**-1,59%**	**-3,00%**	**-3,61%**

Source: own elaboration with data from PENSREF, INSS and AIReF

This disequilibrium is nonetheless aggravated in the pessimistic scenario; that is, in the case the GDP, the employment rate and the total productivity factor decrease more or increase less. These results prove the strong dependency that the system has on the economic situation, and how a decrease or a lower increase in those macroeconomic indicators could affect the sustainability of the system. The Spanish public pension system is not ready for an economic disruption that would cause severe consequences both in income and expenditures. The fragility that this system imposes makes it necessary to think about appropriate reforms that are concerned about the future of the system and that are ready to react if difficult times arise.

By comparison, Table 8 contains a summary of the estimations that have been made for the Sweden case. Projected public pension spending as a percentage of GDP will end up at 6.60% in 2050, a decrease of 1.6% points compared to the starting year 2017. On the other hand, the earnings-related pensions will decrease in 0.3 percentage points until 2050 mainly due to the ageing effect. This decrease in the income side is however compensated by the higher decrease in pension spending and hence, we see how from 2017 to 2050 the Swedish system is expected to move from a soft deficit of 0.30% to a 1.00% superavit. These results suggest that even though the Swedish system is also threatened by the adverse demographic

shifts that most of the European developed countries are suffering nowadays, an adequate pension system allows a sustainable situation.

Table 8: Swedish Deficit/Superavit evolution (% of GDP)

SWEDEN	2017	2020	2030	2040	2050
Pension Spending	8,20%	7,60%	7,20%	6,80%	6,60%
Contribution Income	7,90%	7,80%	7,70%	7,60%	7,60%
Deficit	**-0,30%**	**0,20%**	**0,50%**	**0,80%**	**1,00%**

Source: Own elaboration from Regeringskansliet

7. DISCUSSIONS AND CONCLUDING REMARKS

So far, most of the questions contemplated at the beginning of the project have been covered, so the objective of the research has been successfully achieved. We have described the current situation of the system, as well as its threats, and we have compared its current and future status with a sustainable public pension system: the Swedish NDC system. Nonetheless, some problems have arisen during its expounding as the difficulty in the computation of an updated actuarial balance as well as the need of such depth and detail has made it impossible to compute it. Further research would then be needed if an accurate representation of how the Spanish public pension situation would look like in the form of an actuarial balance is desired.

We have seen how both countries are sensitive to demographic and economic changes and how the nature of each system responds to these changing circumstances. Furthermore, the analysis performed is enough for us to conclude that the Spanish situation is far from the Swedish one and thus, the advantages that a transition to a notional defined contribution model would imply. The annual preparation of the actuarial balance as well as the implementation of automatic mechanisms without the need for approval would facilitate an efficient revision and reform of the system. Hence, one of the main implications of the results obtained in the project is that automatic mechanisms are strictly necessary. in order to avoid unfavorable situations and to be prepared for economic disruptions.

There are many different topics that are out of the scope of this project, and would be interesting to review: the computation of an updated actuarial balance, a more detailed projection of the situation if further reforms were adopted … Researchers and politicians should expand their views towards new structural changes rather than small reforms that help just temporarily to maintain the system or that are not fully applied. Even though the

transition to a different system (e.g. the Swedish NDC system) would imply important transition costs, maybe this is the only solution to solve this worrisome problem about the sustainability of the public Spanish pension system. A deeper study would be appealing for further researchers.

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9. APPENDIX

Table 1. Demographic and macroeconomic projections

Spain	EC-EPC (AWG) 2018 projections
Main demographic and macroeconomic assumptions	

Demographic projections - Eurostat 2015-based population projections	Ch 16-70	2016	2020	2030	2040	2050	2060	2070
Fertility rate	0,6	1,31	1,57	1,80	1,87	1,88	1,88	1,88
Life expectancy at birth								
males	6,4	80,5	81,0	82,3	83,6	84,8	85,9	86,9
females	5,2	86,0	86,3	87,4	88,4	89,4	90,3	91,2
Life expectancy at 65								
males	4,6	19,3	19,6	20,6	21,5	22,3	23,2	23,9
females	4,1	23,2	23,4	24,3	25,1	25,9	26,6	27,3
Net migration (thousand)	123,8	12,9	51,2	119,4	163,4	170,9	153,8	136,8
Net migration as % of population	0,2	0,0	0,1	0,3	0,3	0,3	0,3	0,3
Population (million)	3,4	46,4	46,6	47,2	48,3	49,3	49,6	49,9
Children population (0-14) as % of total population	1,3	15,1	14,7	13,8	14,7	15,7	15,7	16,3
Prime age population (25-54) as % of total population	-9,5	44,0	41,4	35,0	31,6	32,4	33,7	34,6
Working age population (15-64) as % of total population	-9,0	66,0	65,1	61,2	55,1	52,1	55,0	57,1
Elderly population (65 and over) as % of total population	7,7	18,9	20,2	25,0	30,2	32,2	29,3	26,6
Very elderly population (80 and over) as % of total population	6,7	6,1	6,3	7,7	9,8	12,6	14,8	12,8
Very elderly population (80 and over) as % of elderly population	15,7	32,3	31,1	30,6	32,3	39,2	50,5	48,0
Very elderly population (80 and over) as % of working age population	13,1	9,2	9,6	12,5	17,7	24,3	26,9	22,4
Macroeconomic assumptions*	AVG 16-70	2016	2020	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1,5	0,4	0,8	1,3	1,0	1,8	2,2	1,9
Employment (growth rate)	0,1	-0,3	-0,3	0,2	-0,4	0,2	0,6	0,4
Labour input : hours worked (growth rate)	0,1	-0,3	-0,2	0,2	-0,4	0,2	0,6	0,4
Labour productivity per hour (growth rate)	1,3	0,7	1,0	1,1	1,5	1,6	1,6	1,5
TFP (growth rate)	0,9	0,4	0,5	0,7	0,9	1,1	1,0	1,0
Capital deepening (contribution to labour productivity growth)	0,5	0,4	0,5	0,4	0,5	0,6	0,5	0,5
Potential GDP per capita (growth rate)	1,3	0,4	0,7	1,1	0,8	1,7	2,2	1,8
Potential GDP per worker (growth rate)	1,3	0,7	1,1	1,0	1,4	1,6	1,6	1,5
Labour force assumptions	Ch 16-70	2016	2020	2030	2040	2050	2060	2070
Working age population (15-64) (in thousands)	-2.212	30.659	30.314	28.875	26.627	25.684	27.260	28.447
Population growth (working age:15-64)	0,5	-0,3	-0,2	-0,8	-0,9	0,3	0,7	0,2
Population (20-64) (in thousands)	-2.733	28.451	27.928	26.511	24.326	23.154	24.501	25.718
Population growth (20-64)	0,7	-0,5	-0,4	-0,6	-1,0	0,2	0,7	0,2
Labour force 15-64 (thousands)	-840	22.766	22.861	22.307	20.679	19.807	20.928	21.926
Labour force 20-64 (thousands)	-905	22.526	22.603	22.033	20.421	19.528	20.620	21.621
Participation rate (20-64)	4,9	79,2	80,9	83,1	84,0	84,3	84,2	84,1
Participation rate (15-64)	2,8	74,3	75,4	77,3	77,7	77,1	76,8	77,1
young (15-24)	0,7	33,3	32,5	35,0	33,9	33,3	33,6	34,0
prime-age (25-54)	2,2	87,4	88,7	89,8	89,7	89,8	89,7	89,7
older (55-64)	22,6	59,2	66,8	78,5	81,5	81,8	82,4	81,8

Participation rate (20-64) - FEMALES	9,5	73,7	76,8	81,2	83,0	83,4	83,2	83,2
Participation rate (15-64) - FEMALES	7,1	69,2	71,7	75,6	77,0	76,4	76,0	76,2
young (15-24)	0,5	31,4	30,5	33,0	31,9	31,2	31,5	31,9
prime-age (25-54)	5,7	82,3	84,9	88,0	88,1	88,2	88,2	88,1
older (55-64)	32,2	51,7	61,2	76,4	82,5	83,7	84,3	83,9
Participation rate (20-64) - MALES	0,3	84,6	85,0	85,0	84,9	85,3	85,0	84,9
Participation rate (15-64) - MALES	-1,4	79,3	79,1	78,8	78,4	77,9	77,6	77,9
young (15-24)	0,8	35,2	34,3	36,9	35,8	35,2	35,6	35,9
prime-age (25-54)	-1,3	92,5	92,3	91,6	91,2	91,3	91,1	91,2
older (55-64)	12,8	67,0	72,6	80,6	80,4	79,7	80,4	79,7
Average effective exit age (TOTAL) (1)	2,5	64,0	65,3	66,3	66,3	66,3	66,4	66,4
Men	2,8	63,4	64,8	66,0	66,1	66,1	66,1	66,2
Women	2,2	64,5	65,8	66,5	66,6	66,6	66,6	66,7
Employment rate (15-64)	11,4	59,6	63,0	66,3	69,1	71,0	70,7	71,0
Employment rate (20-64)	13,7	63,9	68,0	71,6	74,9	77,9	77,7	77,6
Employment rate (15-74)	11,4	52,6	55,6	57,9	59,0	60,6	63,6	63,9
Unemployment rate (15-64)	-11,9	19,7	16,4	14,2	11,0	7,9	7,9	7,9
Unemployment rate (20-64)	-11,6	19,3	16,0	13,8	10,8	7,7	7,7	7,7
Unemployment rate (15-74)	-12,0	19,6	16,2	13,7	10,5	7,5	7,6	7,6
Employment (20-64) (in millions)	1,8	18,2	19,0	19,0	18,2	18,0	19,0	20,0
Employment (15-64) (in millions)	1,9	18,3	19,1	19,1	18,4	18,2	19,3	20,2
share of young (15-24)	3,3	5%	5%	6%	7%	8%	8%	8%
share of prime-age (25-54)	-9,0	80%	76%	67%	67%	73%	72 %	71 %
share of older (55-64)	5,7	15%	19%	26%	27%	19%	20 %	21 %
Dependency ratios	Ch 16-70	2016	2020	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	0,9	18,7	20,9	25,2	24,7	17,9	18,1	19,5
Old-age dependency ratio 15-64 (3)	18,0	28,6	31,0	40,8	54,7	61,9	53,2	46,6
Old-age dependency ratio 20-64 (3)	20,7	30,9	33,7	44,4	59,9	68,6	59,2	51,6
Total dependency ratio (4)	23,8	51,5	53,7	63,3	81,4	91,9	81,8	75,3
Total economic dependency ratio (5)	-17,8	152,1	139,3	133,6	143,9	153,7	145,4	134,3
Economic old-age dependency ratio (15-64) (6)	13,1	47,2	47,3	55,9	71,4	80,5	70,4	60,2
Economic old-age dependency ratio (15-74) (7)	10,4	46,8	46,4	53,0	66,3	75,6	67,2	57,2

Source: PENSREF database

Figure 1: Pension spending – Realistic projections.

Realistic		8%	13%	10%	18%
	2017	**2020**	**2030**	**2040**	**2050**
Pensioners	9.572.436	9.618.430	9.756.411	9.888.643	10.015.125
Annual average pension	11.134,44	11.746,59	14.040,72	16.782,91	20.060,65
Life expectancy	83,3	83,7	84,9	86,0	87,1
Pension spending	106.584	112.984	136.987	165.960	200.910
GDP	1.166.319	1.260.942	1.418.997	1.566.255	1.852.159
Pension spending (% GDP)	**9,14%**	**8,96%**	**9,65%**	**10,60%**	**10,85%**

Source: own elaboration with data from PENSREF, INSS and AIReF.

Figure 2: Pension spending – Optimistic projections.

Optimistic		9%	14%	11%	19%
	2017	**2020**	**2030**	**2040**	**2050**
Pensioners	9.572.436	9.618.430	9.756.411	9.888.643	10.015.125
Annual average pension	11.134,44	11.746,59	14.040,72	16.782,91	20.060,65
Life expectancy	83,3	83,7	84,9	86,0	87,1
Pension spending (€ millions)	106.584	112.984	136.987	165.960	200.910
GDP (€ millions)	1.166.319	1.272.605	1.444.848	1.609.237	1.919.080
Pension spending (% GDP)	**9,14%**	**8,88%**	**9,48%**	**10,31%**	**10,47%**

Source: own elaboration with data from PENSREF, INSS and AIReF.

Figure 3: Pension spending – Pesimistic projections.

Pesimistic		7%	12%	9%	17%
	2017	**2020**	**2030**	**2040**	**2050**
Pensioners	9.572.436	9.618.430	9.756.411	9.888.643	10.015.125
Annual average pension	11.134,44	11.746,59	14.040,72	16.782,91	20.060,65
Life expectancy	83,3	83,7	84,9	86,0	87,1
Pension spending	106.584	112.984	136.987	165.960	200.910
GDP	1.166.319	1.249.279	1.393.379	1.524.044	1.787.003
Pension spending (% GDP)	**9,14%**	**9,04%**	**9,83%**	**10,89%**	**11,24%**

Source: own elaboration with data from PENSREF, INSS and AIReF.